USER MANUAL

THZ-D Series | Terahertz Detectors for Universal Monitors

gentec-eo
PARTNERS for ACCURACY

121-103809

WARRANTY

First Year Warranty

The Gentec-EO thermal power and energy detectors carry a one-year warranty (from date of shipment) against material and /or workmanship defects when used under normal operating conditions. The warranty does not cover recalibration or damages related to misuse.

Gentec-EO will repair or replace at its option any wattmeter or joulemeter which proves to be defective during the warranty period, except in the case of product misuse.

Any unauthorized alteration or repair of the product is also not covered by the warranty.

The manufacturer is not liable for consequential damages of any kind.

In the case of a malfunction, contact the local Gentec-EO distributor or nearest Gentec-EO office to obtain a return authorization number. Return the material to the address below.

All customers:

Gentec-EO, Inc.
445 St-Jean-Baptiste, Suite 160
Quebec, QC, G2E 5N7
Canada

Tel: (418) 651-8003
Fax: (418) 651-1174
Email: service@gentec-eo.com
Web: www.gentec-eo.com

Revision 1.8

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

1 GENERAL INFORMATION

1.1 INCLUDED WITH YOUR THZ-D

The following items are included with your THZ-D power detector:

Description	Part name	Part number
THZ-D power detector		
Calibration certificate		
Personal Wavelength Correction™ certificate		
Rubber cap		
Tube		

The following items can be purchased separately:

Description	Part name	Part number
Digital optical chopper	SDC-500	202171
Pelican carrying case	PEL-#	
Extension cable	EXT-#	
Stand	STAND-S-233	200160

1.2 INTRODUCTION

The Gentec-EO THZ-D Series is made up of two high performance, thermal power probes…THZ12D a thermopile and THZ9D a Pyroelectric. Each unit is built for durability, compactness and ease of operation.

The THZ12D-3S-VP includes an optical absorber that exhibits nearly flat spectral absorption from 10.6 µm to 600 µm.

The THZ9D-20mS-BL includes a black coating for broadband response from 10.6 µm to 3000 µm. The spectral correction factors are programmed from 10.6 µm to 440 µm. It can be used at wavelengths greater than 440 µm but without wavelength correction factors.

The THZ-D Series benefits from the use of a DB-15 male, “Smart Interface” connector, containing an EEPROM (Erasable Electrical Programmable Read-Only Memory) programmed with the calibration sensitivity, the spectral correction factors at different wavelengths and other data related to the specific THZ-D Series probe. This connector allows the monitor to automatically adjust its setting to those of the power probe being connected.

The D0 versions of the THZ9D series, can be used with the APM-D part number 201848 (not compatible with a T-RAD Analog) and an oscilloscope or an OEM acquisition system. Please note that the noise equivalent power will depend on the acquisition system.

Every THZ-D Series are designed for high resistance to electromagnetic interference.

THZ-D Series detectors are designed for user-friendly power measurement of CW and/or Quasi CW (high rep rate) lasers using monitors, MAESTRO, U-LINK, INTEGRA or M-LINK. (M-LINK and INTEGRA do not support THZ9D.)

THZ-D Series detectors require no external power source[1]. They can also be used with a 1 MΩ input impedance oscilloscope[1] (or fast chart recorder). The calibrated V/W sensitivity is documented in the calibration certificate of each unit. The spectral correction of this sensitivity is also documented in the typical “Personal wavelength correction” certificate, see section **7**.

1 An APM-D is required.

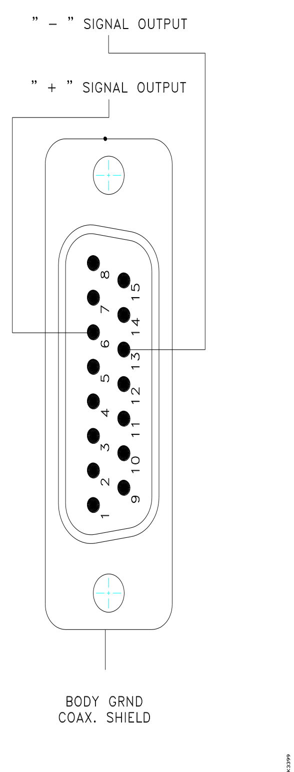
1.3 THZ-D Series "SMART INTERFACE" CONNECTOR

The DB-15 male "Smart Interface" connector contains an EEPROM (Erasable Electrical Programmable Read-Only Memory) programmed with the calibration sensitivity and other data related to the specific THZ-D wattmeter in use. Faster set-ups are obtained because the monitor automatically adjusts to the characteristics of the wattmeter, when the "Smart Interface" is connected to the monitor.

The DB-15 "Smart Interface" connector pin-out is (see Fig. 1-1):

1-	USED BY MONITORS
2-	" " " "
3-	" " " "
4-	" " " "
5-	" " " "
6-	"+" SIGNAL OUTPUT
7-	'-' SUPPLY VOLTAGE THZ9D ONLY
8-	USED BY MONITORS
9-	'+' SUPPLY VOLTAGE THZ9D ONLY
10-	USED BY MONITORS
11-	" " " "
12-	" " " "
13-	"-" SIGNAL OUTPUT
14-	USED BY MONITORS
15-	" " " "
SHELL-	COAX. SHIELD / BODY GRND

NOTE : Verify with Gentec-EO for supply voltage requirements.



DB–15 "Smart Interface" connector Pin–out Fig. 1–1

1.4 THZ-D SERIES SPECIFICATIONS

The following specifications are based on a one-year calibration cycle, an operating temperature of 15 to 28ºC and a relative humidity not exceeding 80% and a storage temperature from 5 to 45 ºC with relative humidity not exceeding 80%.

	THZ9D-20mS-BL-D0
Monitor Compatibility	MAESTRO, U-LINK
Effective Aperture Diameter	Ø9 mm
Sensor	Pyroelectric
Absorber	BL
Projected Spectral Range	10 – 3000 µm [2]
Reference Spectral Range	10 – 440 µm [2]
Spectral Range	10 – 440 µm [2]
Calibration Wavelength	10.6 µm
Max. Average Power	With MAESTRO : 20 mW With U-LINK : 25 mW
Max. Average Power Density	50 mW/cm^2
Power Noise Level (RMS)	300 nW
Optical Chopper Frequency	10 ± 1 Hz
Typical Rise time (0-95%)	< 0.2s
Typical Sensitivity	120 V/W
Calibration Uncertainty	± 5 % @ 10.6 µm ± 15 % @ 10.6-440 µm [3]
Dimensions (H x W x D, in mm)	Ø38.1 x 26.2
Weight	91 g

Specifications subject to change without notice.

2 From 10 to 440µm, spectrometer measurement with multiple laser references validation.
From 440 to 600 µm, spectrometer measurement only.
From 600 to 3000 µm, relative measurement only.
For more details refer to Appendix B.

3 Estimated on typical absorber spectral absorption measurements in the THz range.

Revision 1.8

	THZ12D-3S-VP-D0	
Monitor Compatibility	MAESTRO, U-LINK, M-LINK, INTEGRA	
Effective Aperture Diameter	Ø 12 mm	
Projected Spectral Range	10 – 3000 µm [2]	
Reference Spectral Range	10 – 440 µm [2]	
Spectral Range	10 – 600 µm [2]	
Calibration Wavelength	10.6 µm	
Power Noise Level [4] [5]	± 0.5 µW	
Thermal Drift [6]	12 µW/ºC	
Minimum Measurable Power	100 µW [7]	
Typical Rise time (0-95%)	3.0 s	
Typical Sensitivity	200 mV/W	
Calibration Uncertainty	± 3.0 % @ 10.6µm ±8% @ 10.6-300µm [3] ±15% @ 300-440µm [3]	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power	3 W	
Max. Average Power (1 min) (cooling : minimum 3 min)	3 W	
Minimum Repetition Rate	7 Hz with Anticipation 1 Hz without Anticipation	
Max. Average Power Density (1 W CW)	30 W/cm2	
Max. Energy Density	< 1 J/cm^2	
Dimensions (H x W x D, in mm)	With isol. tube: 73 x 73 x 72	W/o isol. tube: 73 x 73 x 20
Weight (head only, with isolation tube)	0.316 kg	
Cooling	Heat sink	
Recommended Load Impedance	100 kΩ	
Output Impedance	N. A.	
Linearity vs Beam Dimension	± 0.7 %	
PCB Electrical Supply	N. A.	
Max Output Signal	N. A.	

Specifications subject to change without notice.

4 Nominal value, actual value depends on electrical noise in the measurement system.

5 Without anticipation. ± 5 µW with anticipation.

6 At 150 µW.

7 Depending on thermal stability of the environment.

2 OPERATING INSTRUCTIONS

2.1 Used with a compatible monitor

2.1.1 THZ9D

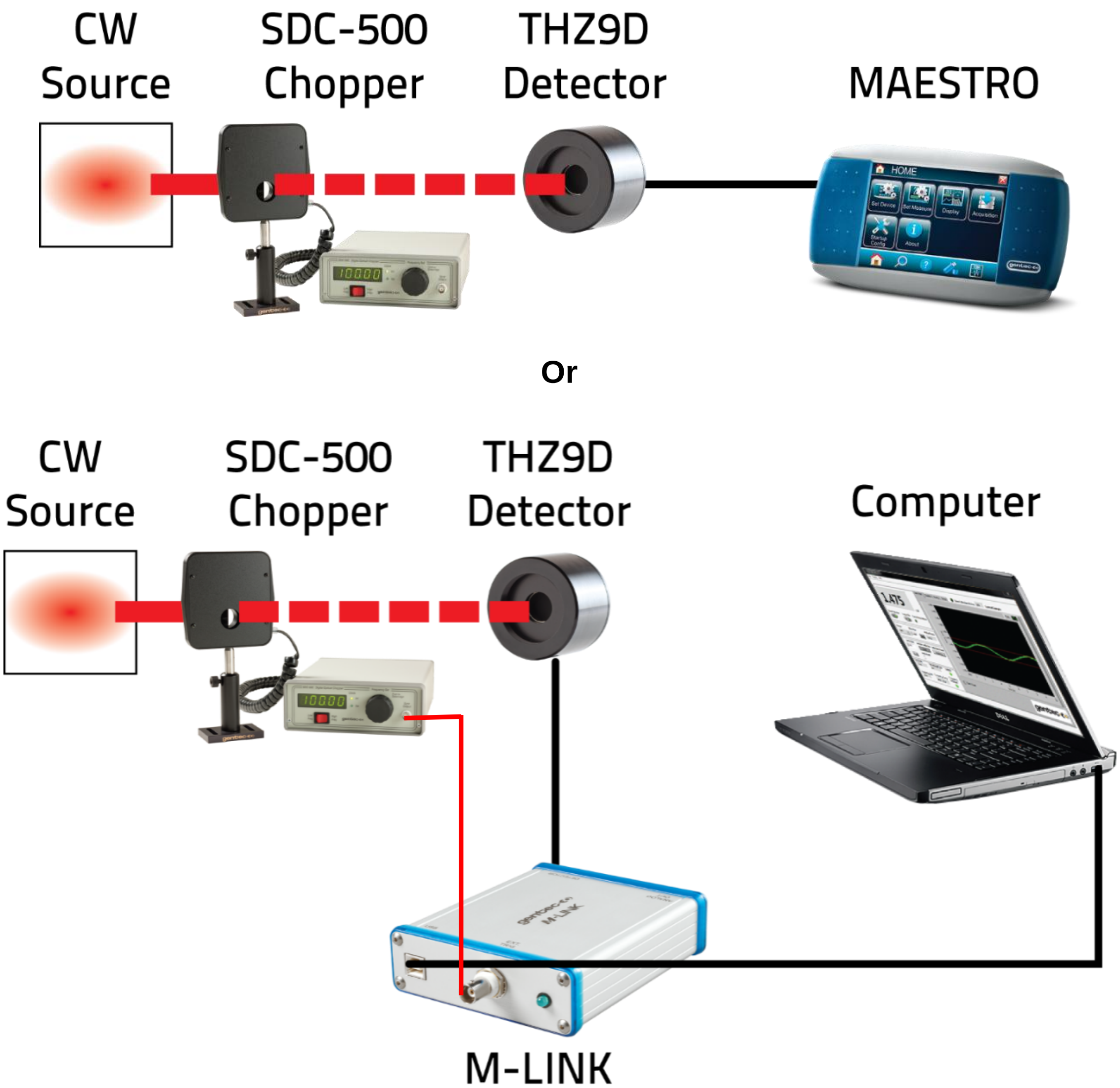


Figure 2.1: THZ9D with monitor

Refer to the user manual of each monitor for further information.

2.1.2 THZ12D

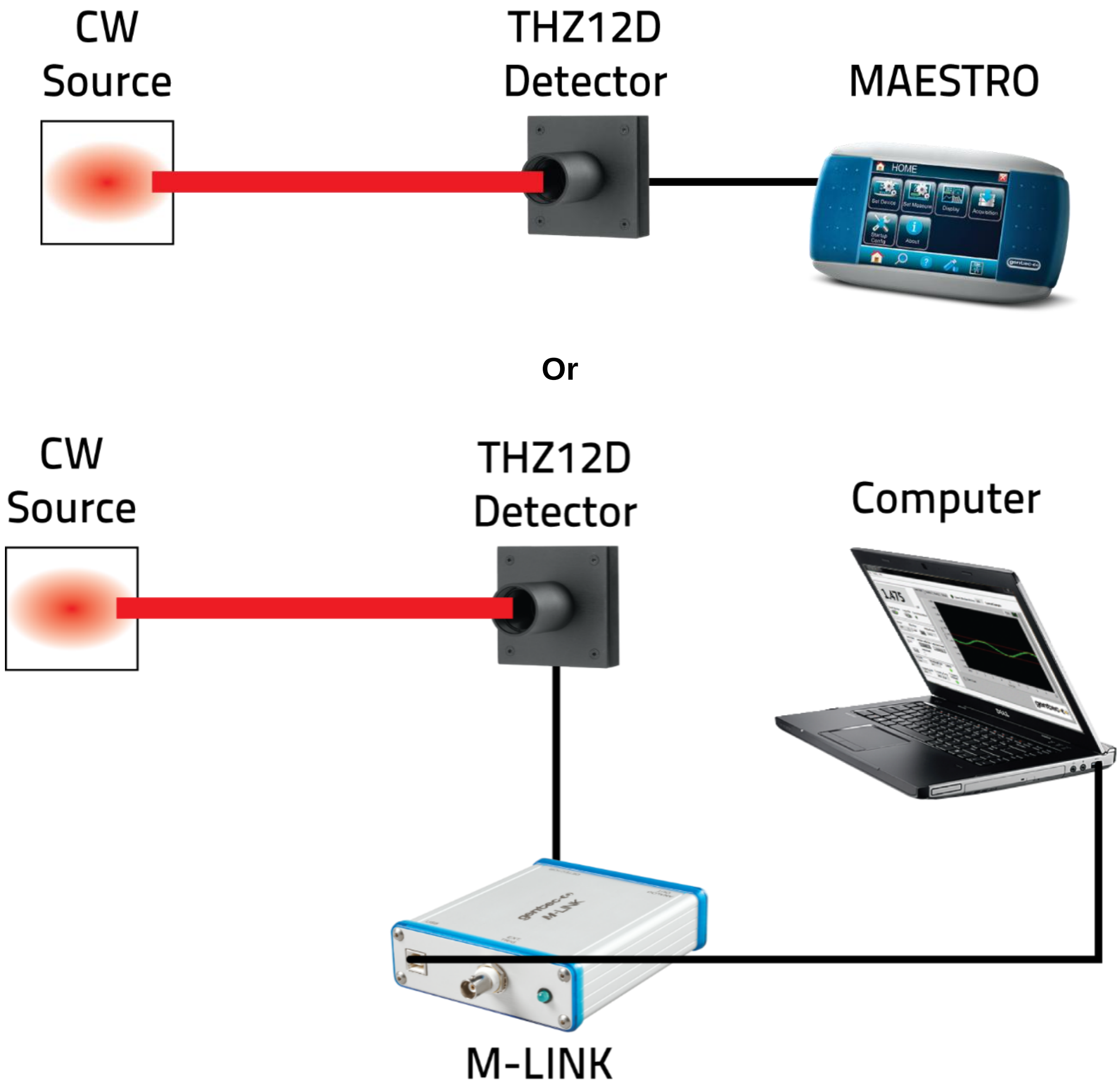


Figure 2.2: THZ12D with monitor

Refer to the user manual of each monitor for further information.

2.1.3 General Instructions

1- Place the detector on its optical stand (Must use a delrin post).

2- Connect the detector to a compatible Gentec-EO laser power monitor (see Fig. 2-1). (Refer to specifications)

NOTE: The parameters programmed in the DB-15 “Smart Interface” are for a 1 MΩ load impedance.

3- Remove the detector's protective cover, when applicable.

4- The THZ9D requires the use of an Optical Chopper running at 10 Hz. Place the optical chopper (SDC-500 or equivalent) into the laser beam path between the laser and the THZ9D. Make sure that the laser beam is fully contained within the 9 mm detector aperture.

CAUTION: Be careful not to exceed the maximum levels and densities in: energy, peak power and average power as stated in the specifications pages.

NOTE: As with all thermopile or pyroelectric devices, these detectors have some position and beam size linearity. For the most accurate measurements, the beam should normally be centered on the sensor surface and the beam diameter should ideally be close to that of the original calibration conditions, which is 100% encircled power (of a semi-Gaussian beam stopped at $1/e^2$) applied to a diameter equal to 80% of the detector aperture. If you use of a divergent lens, a Lambertian diffuser, or any other method of beam spreading, please take note that all of the laser light must be directed within the detector aperture and that the optical losses must be known. The measurement must then be corrected to compensate for these losses.

2.2 Working at other wavelengths than 10.6µm

The monitor will automatically configure himself using the data stored in the EEPROM of the DB-15 "Smart Interface". This includes the calibration sensitivity and wavelength corrections for 20 current wavelengths [8] [9].

For more precise measurements with a THZ-D Series detectors at wavelengths other than those already corrected by the typical "Personal wavelength correction ™" [8] data programmed into the "Smart Interface", a correction factor [9] is automatically set in the monitor to compensate for the change in sensitivity of the wattmeter caused by the change in absorption of the optical absorber at different wavelengths. This automatic correction is a linear interpolation between two measured values of the typical ''Personal wavelength correction''.

[8] Refer to the spectral curve of the typical " Personal Wavelength Correction ™ " certificate at section **7**
[9] Refer to the monitor manuals for instructions.

2.3 THZ9D used with an oscilloscope:

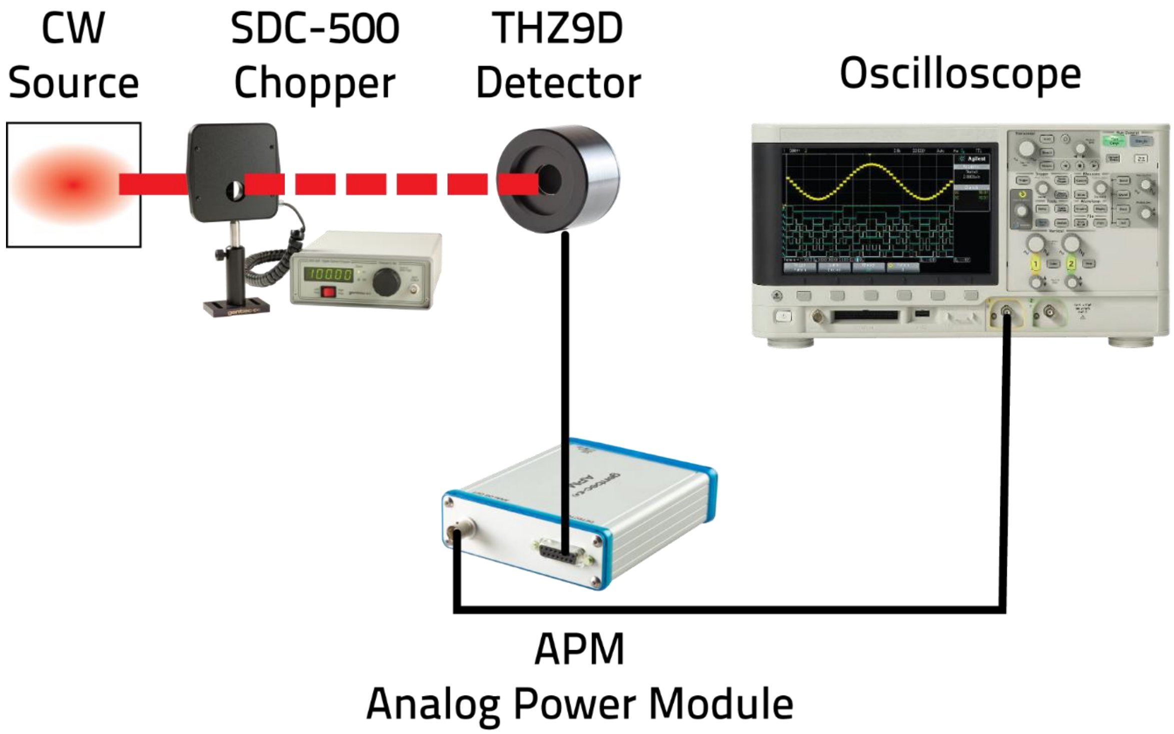


Figure 2.3: THZ9D with oscilloscope

2.3.1 General Instructions

Please note that the noise equivalent power will depend on the acquisition system.

1- Install the wattmeter on its optical stand

2- Connect the wattmeter to the APM-D (not compatible with a T-RAD Analog) and switch it on. (Battery or power supply needed)

3- Connect the APM-D to the oscilloscope.

NOTE: The required load impedance is 1 MΩ and ≤ 30 pF.

4- Put the optical chopper (SDC-500 or equivalent) into the laser beam path and adjust the frequency at 10Hz (laser beam must be contained within the aperture).

5- Put the wattmeter head into the laser beam path after the chopper (laser beam must be contained within the aperture).

CAUTION: Be careful not to exceed the maximum levels and densities in: energy, peak power and average power as stated in the specifications pages.

NOTE: As with all pyroelectric devices, these detectors have some position and beam size sensitivity. For the most accurate measurements, the beam should normally be centered on the sensor surface and the beam diameter should ideally be close to that of the original calibration conditions, which is 100% encircled power (of a semi-

Gaussian beam stopped at $1/e^2$) applied to a diameter equal to 80% of the detector aperture. The use of a divergent lens, a Lambertian diffuser such as opal glass, or any other method of beam spreading, is recommended for this purpose. Please take note that all of the laser light must be directed within the detector aperture and that the transmission loss through the optical component must be known.

6- Adjust the oscilloscope so it triggers on the wattmeter pulse or on the chopper sync signal.

7- Measure the baseline to peak voltage generated by the wattmeter.

8- Determine the wattmeter Volt/watt sensitivity from the detector identification label or calibration certificate. Choose the value stated for the wavelength being used.

9- Calculate the optical power using the following equation:

Power = (V_{peak}-$V_{baseline}$) / Calibration sensitivity

Ex:

- V_{peak}-$V_{baseline}$ = 1 volt
- Detector calibration sensitivity (100 Volts / watt)

Power = 1 Volt / 100 V/W = 10 mW

NOTE: Exclude any DC offset from the pulse peak value measurement.

2.3.2 Working at other wavelengths than 10.6µm

For measurements with THZ-D Series detectors at wavelengths other than 10.6µm, a correction factor must be set to compensate for the change in sensitivity of the wattmeter caused by the change in absorption of the optical absorber at different wavelengths.

To correct for the change in absorption refer to the spectral curve of the typical " Personal Wavelength Correction ™ " certificate supplied for the wattmeter and calculate **K** by taking the percentage difference between the absorption @10.6 µm and that at the desired wavelength.

$$K = \frac{A(\lambda 1)}{A(@10.6\mu m)}$$

Power = (V_{peak}-V_{offset}) / Calibration sensitivity / K

Here $A(\lambda 1)$ = Absorption of the THZ @ the desired wavelength.
$A(@10.6\mu m)$ = Absorption of the THZ @ 10.6 µm

A sample calculation follows:

$A(\lambda 1)$ = 92 %.
$A(@10.6\mu m)$ = 94 %

K = $\frac{A(\lambda 1)}{A(@10.6\mu m)}$ x 100

K = $\frac{92\%}{94\%}$ x 100 = 0.9787 x 100 = **97.87 %**

Ex:

- $(V_{peak}-V_{offset})$ = 1 volt
- Detector calibration sensitivity @10.6 µm (100 Volts / Watt)

Power = 1 Volt / 100 V/W / 97.87% = 10.218 mW

3 DAMAGE TO THE OPTICAL ABSORBER MATERIALS

▼

At any time, the beam's incident area should not be less than 10% of the detector's aperture. Please check with Gentec-EO to make measurements with such small beams.

Damage is usually caused by exceeding the manufacturer is specified maximum tolerances:

- Average Power Density
- Peak Power Density
- Single Pulse Energy Density

Refer to the THZ-D Series wattmeter specifications pages. Damage can also be caused when using a detector with a contaminated absorber or attenuator surface.

The damage thresholds specified in the specifications section refer to a visible alteration of the absorber surface. In practice, a slight alteration will not affect the wattmeters response. Consider the wattmeter to be damaged and/or out of calibration when large-scale damage is evident or you can see the metal electrode beneath the coating[10].

In the case of a TEMoo (Gaussian) beam, the maximum peak power and energy density can be calculated using the following equation:

$$\text{Density (power or energy)} \approx \frac{2Io}{\pi W^2}$$

Where Io is the total beam power or energy

W is the beam radius at $1/e^2$ and $\pi = 3.1416$

NOTE: The beam waist for a TEMoo beam is the radius of a circle centered on the beam axis and containing 86 % of the beam energy. Ref.: SIEGMAN, A.E., An Introduction to Lasers and Masers, p. 313 (Mcgraw-Hill Series in the Fundamentals of Electronic Science).

Example of energy density;

Io = 1 joule (total energy)
W = 1 cm

$$\text{Energy density} = \frac{2 \times 1 \text{ joule}}{\pi \times (1 \text{ cm})^2} = 0.64 \text{ joule/cm}^2$$

Example of power density calculation;

Io = 1 MegaWatt (total power)
W = 1 cm

$$\text{Power density} = \frac{2 \times 1 \text{ MegaWatt}}{\pi \times (1 \text{ cm})^2} = 0.64 \text{ MW/cm}^2$$

---

10 Contact Gentec-EO for evaluation, repair, recalibration, or replacement (refer to the WARRANTY instructions).

4 OPTIONAL ACCESSORIES

Contact Gentec-EO for a complete list of accessories, their specifications and features. Partial list:

- APM-D (for connecting THZ9D Series to an oscilloscope).
- MAESTRO monitor
- U-LINK monitor
- M-LINK Monitor
- SDC-500 Optical Chopper
- Carrying case

5 APPENDIX A

5.1 Recycling and separation procedure for WEEE directive 2002/96/EC.

This section is used by the recycling center when the detector reaches its end of life. Breaking the calibration seal or opening the detector will void the detector warranty.

The complete detector contains

- 1 Detector with wires or DB-15.
- 1 CD (instruction manual, software and drivers)
- 1 calibration certificate

5.2 Separation:

Paper: certificates
Wires: Cable Detector.
Printed circuit board: inside the Detector and DB-15, no need to separate (less than 10 cm^2).
Aluminum: Detector casing.

6 Appendix B: THZ detectors calibration

Gentec-EO has made significant improvement in the accuracy of the calibration of THZ power detector. We have developed a rigorous calibration method and new thermal THz detector that allow absolute power and energy measurement based on a validated reference curve from 10 µm to 440 µm (30 THz to 0.70 THz) and on PTB international THZ gold standard. The purpose of this application note is to explain the new method of calibration and validation for Gentec-EO THz detectors and to characterize its new spectrally flat THz Thermal Probe.

CALIBRATING IN THE THz REGION - A CHALLENGE

Typical traceable detector calibration methods involve the calibration at one particular wavelength with traceable Gold Standard previously obtained from a recognized international institution such as NIST in USA and PTB in Germany (most typical wavelength are 1.064 or 10.6 µm). In addition, the relative spectral absorption of the sensor is determined, using a Near IR (0.25 to 2.5 µm) spectrometer and a traceable spectral standard. A wavelength correction factor is then applied to provide the best possible calibration uncertainty over the detector's calibrated spectral range. Both calibration systems need to be traceable to an international calibration laboratory. Calibration can then be called traceable to NIST and/or other recognized international standards laboratory. Thus, with quantitative traceability, the total uncertainty of the calibration can be calculated and specified. It is important to know that, however, the calibrated range using this method is somewhat limited and doesn't cover the complete THz wavelength range.

The rapidly expanding development of THz sources, both CW and Pulsed, has posed numerous challenges to our industry, including how to make accurate measurements of power and energy. One of the biggest difficulties is that before 2009 there was no recognized international calibration standard or service available that covered THz spectrum. This has forced us to offer THz products that are not calibrated in the THz range and can therefore only be used for relative measurements. However, in 2009 the staff at PTB in Germany announced that they now provide traceable calibration of THz detectors at the single wavelength 119 µm (or 2.52 THz) with an accuracy of ±15%. Now, they have expanded their calibration capabilities from 70 and to 288µm (or 4.25 THz to 1.04 THz) with better uncertainty (±4%).
We are working very closely with PTB Germany and NIST USA and other well-known international laboratories in order to take advantage of these new standards and to continue to develop better calibration methods for the Gentec-EO THz product line.

Because of the lack of calibrated spectral reference in the THz range, it has been critical that Gentec EO develop a new spectrally flat absorber for a THz sensor that became available on the market in 2011. It has been demonstrated that our organic black and metallic coatings display significant changes in sensitivity in the THz range and thus cannot be used as a wavelength reference. In order to be a valid THz detector reference, the optical absorption must be measured with high accuracy. This requires measuring the total reflectance, both specular and diffuse. In addition, the transmission of the material must be negligible.
Currently, only specular reflectance can be measured in the spectral range of interest; 10 µm to 440 µm. Thus, it was an essential requirement that our new absorber have only specular reflectance and negligible diffuse reflectance. In addition, a very high and constant absorption throughout the THz range is also necessary because of the lack of multi-wavelength THz standards in the World.

THE BREAKTHROUGH

Gentec-EO has intensified its THz development program in recent months, which has led to a technical breakthrough. We have discovered a spectrally flat and very high absorption material for the THz range, from 10 µm to 440 µm (and up to 600 µm) that it is used as the THz absorber for our new thermal probe. This probe, model THZ12D-3S-VP, is believed to be the first low uncertainty (±8%) spectral reference in this portion of broad THz spectral range.

Figure 1 below shows the spectral absorption of two Gentec-EO THz detectors. The red curve represents the low uncertainty "reference absorption spectrum" for our new THZ12D-3S-VP probe. The blue curve gives the typical relative absorption of our "BL" coated Pyroelectric THz probes THZ9D-20mS-BL. The Pyroelectric THz probes cannot be considered as a reference detector for this portion of the Terahertz spectrum, but can be used for relative measurements over the entire THz spectrum (30 THz to 0.1 THz). The reference absorption curve of the new THZ12D-3S-VP was first validated through extensive reflectance measurements together with multiple single wavelength power measurements using the INO SIFIR-50 gas laser and calibrated Gold standards from PTB with power sensitivity measurements at 119 µm made in 2012 and more recently in 2014 at 119 µm, 70.5 µm, 215 µm and 288 µm.

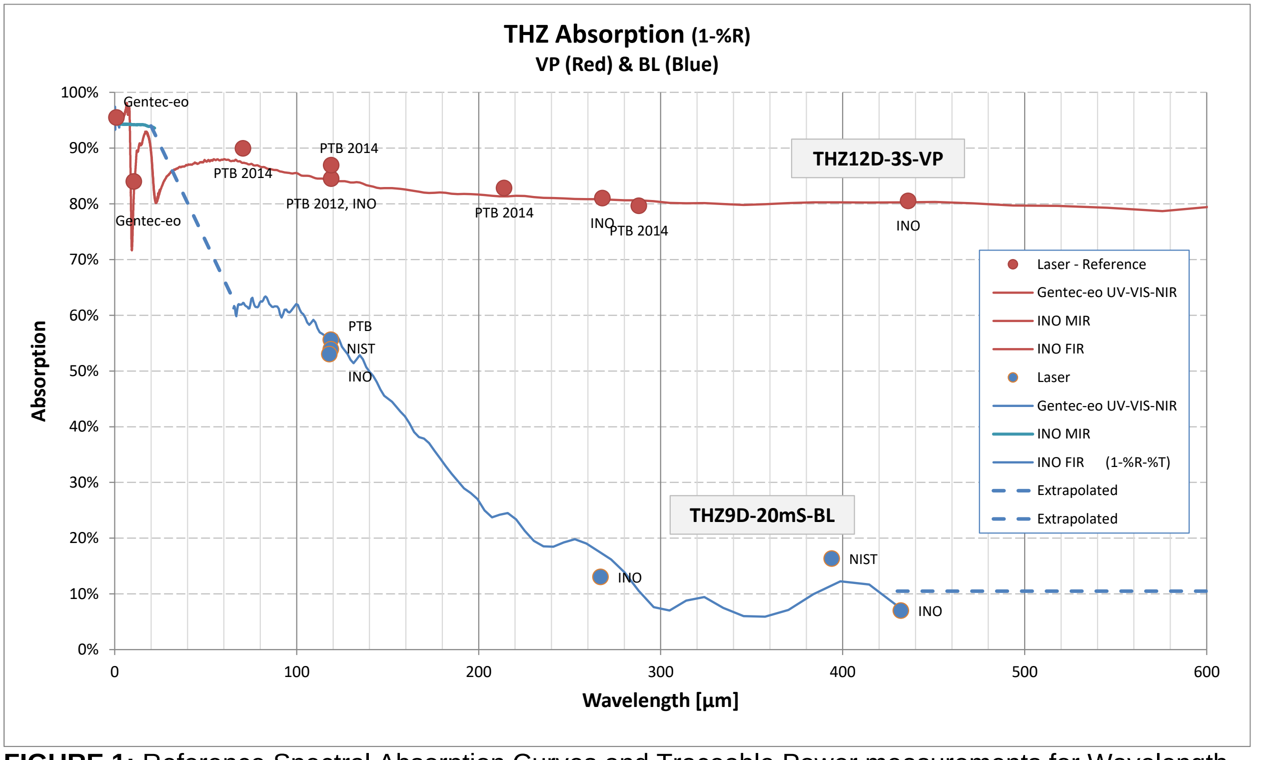


FIGURE 1: Reference Spectral Absorption Curves and Traceable Power measurements for Wavelength Response Validation

In collaboration with the INO (National Institute of Optics) located in Quebec City, Canada, we have characterized our THz detector absorbance at different wavelengths (from 3 µm to 430 µm) using FTIR spectrometers that employ multiple sources to measure over this range. In between the different wavelengths delivered by the source, sensitivities were interpolated from the FTIR absorption curve. The absolute power of the source was measured with two different methods in order to increase the degree of confidence in the measurement.
FTIR absorption curves were validated in the 0.25 µm to 2.5 µm region with our in-house traceable absorption measurement spectrometer.
In addition, traceable sensitivity measurements were made at 10.6 µm against a NIST gold standard and at 119 µm against a PTB gold standard using our THZ12D-3S-VP and THZ9D-20mS-BL PTB traceable detectors. In 2012, the THZ12D-3S-VP-D0 accuracy at 119µm (2.52 THz) was ±15%, but now in 2015 has been reduced to ±4% and with additional wavelengths of 70.5 µm, 215 µm and 288 µm with a similar uncertainty.
These calibrated power measurements are shown on Figure 1 (Red and Blue dots).
As can be seen from the red curve in figure 1, we have successfully created a thermal THz detector that meets our two criteria, for a low uncertainty reference, flat spectral response and high absorption. The spectral response of the THZ12D is the same at 10.6 µm versus our NIST gold standard and at 119 µm versus the PTB Gold standard measurement. Furthermore, the absorption variation from 10.6 µm to 600 µm is of the order of ± 4% and ± 2.5% from 119 µm to 600 µm. In addition, other points of validation were

made using INO measurements. A very good agreement has been obtained with the THZ12D-3S-VP and THZ9D-20mS-BL PTB Gold detectors.

THE NEW CALIBRATION METHOD

1. Gentec-EO calibrates its THZ12D-3S-VP detector using a stable 10.6 µm laser and a NIST Gold Standard Power Detector.

2. A validation of the detector is made to ensure its good working condition and that its behaviour conforms to the specifications at this wavelength and to other detectors of this type according to the reference absorption curve.

3. Traceable Sensitivity for the THZ12D-3S-VP detectors at ±8% from 10.6 µm to 300 µm and ±15% from 300 µm to 440 µm is calculated using the reference absorption curve, as determined by traceable power measurements validation process mentioned in this document. It is then programmed in the EEPROM of the detector for each wavelength between 10 µm to 440 µm (30 THz to 0.68 THz). Beyond 440 µm (0.68 THz) the spectral absorption is estimated.

4. Typical Sensitivity for the THZ9D-20mS-BL and similar Pyroelectric THz detectors is calculated using the typical absorption BL curve. It is then programmed in the EEPROM of the detector for each wavelength between 10 µm to 440 µm (30 THz to 0.68 THz). Beyond 440 µm (0.68 THz), the spectral absorption is estimated. Traceable Sensitivity is determined at 10.6 µm with NIST Gold standard.

FUTURE DEVELOPMENTS

Gentec-EO is working with major organizations defining international standards. As soon as one of these organizations will offer a broadband standard in the THz region, we will integrate it into our calibration method and be able to guarantee a calibration uncertainty with traceability.

Gentec-EO THz detectors are being calibrated by recognized international standards laboratory in order to provide a Gold THz standard for calibration services.

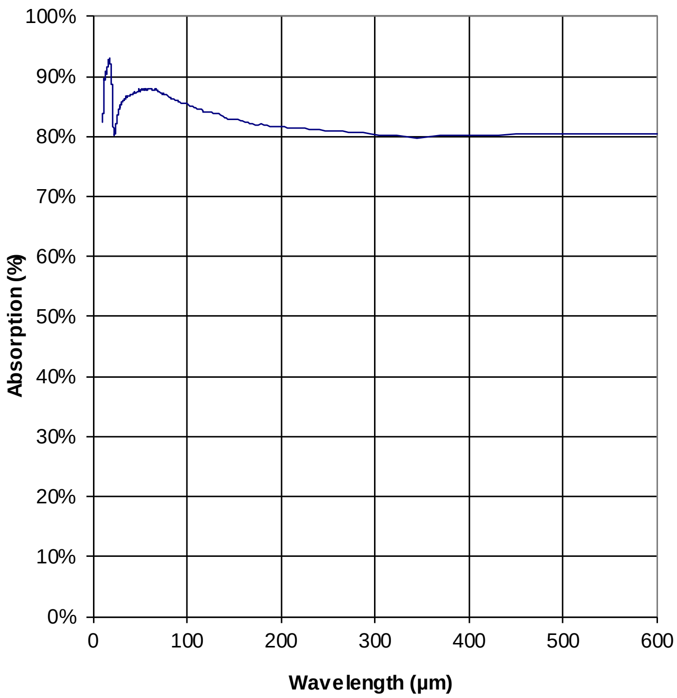
We will continue to update you on the state of the art of calibration of our THz Detectors and Instruments as new developments occur.

7 Appendix C: typical "Personal Wavelength Correction"

gentec-eo

Personal wavelength correction™ Certificate

Spectral Absorption Plot measured for: THZ12D-3S-VP-D0 Power Detector Serial #Typical



Personal Wavelength Correction ™		
Wavelength		Correction
(µm)	(THz)	multiplier
* 10.6	* 28.3	1.000
43	6.97	0.945
52	5.77	0.938
70	4.28	0.942
96	3.12	0.963
119	2.52	0.978
122	2.46	0.980
134	2.24	0.982
158	1.90	0.996
184	1.63	1.005
191	1.57	1.007
214	1.40	1.013
237	1.26	1.016
268	1.12	1.019
288	1.04	1.021
334	0.898	1.028
349	0.859	1.032
394	0.761	1.026
440	0.681	1.026
600	0.500	1.025

* Calibration w avelength

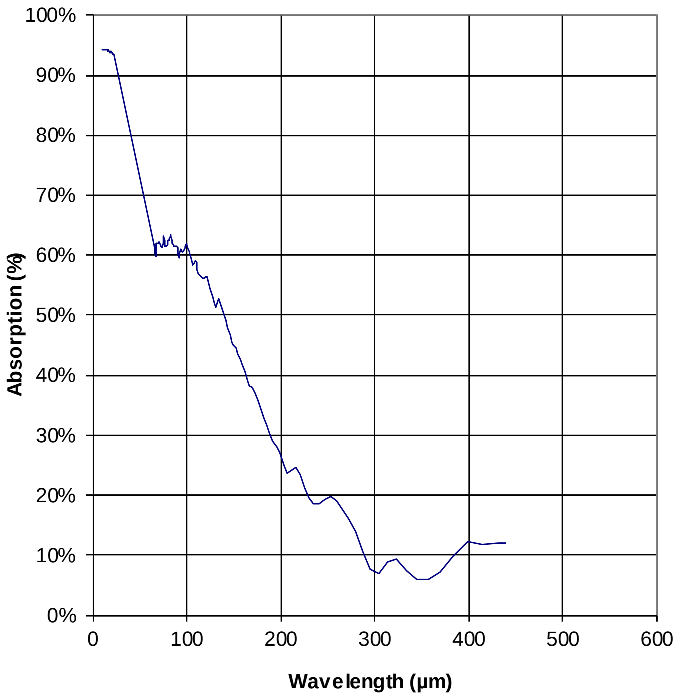
For Gentec-EO monitors, select the proper w avelength in menu

For other monitors, multiply by the correction multiplier
Pow er corrected = Pow er read x correction multiplier
Example: Pow er (158µm) = 10mW x 1.897 = 18.97 mW

gentec-eo

Personal wavelength correction™ Certificate

Spectral Absorption Plot measured for: THZ9D-20mS-BL-D0 Power Detector Serial #Typical



Personal Wavelength Correction ™		
Wavelength		Correction
(µm)	(THz)	multiplier
* 10.6	* 28.3	1.00
43	6.97	1.20
52	5.77	1.30
70	4.28	1.52
96	3.12	1.56
119	2.52	1.68
122	2.46	1.67
134	2.24	1.81
158	1.90	2.21
184	1.63	2.86
191	1.57	3.11
214	1.40	3.89
237	1.26	5.08
268	1.12	5.34
288	1.04	8.93
334	0.898	10.00
349	0.859	15.65
394	0.761	9.50
440	0.681	7.85
600	n/a	n/a

* Calibration wavelength

For Gentec-EO monitors, select the proper wavelength in menu

For other monitors, multiply by the correction multiplier
Power corrected = Power read x correction multiplier
Example: Power (158µm) = 10mW x 1.897 = 18.97 mW

8 DECLARATION OF CONFORMITY

Application of Council Directive(s): **2004/108/EC EMC Directive**

Manufacturer's Name: **Gentec Electro Optics, Inc.**
Manufacturer's Address: **445 St-Jean Baptiste, suite 160**
(Québec), Canada G2E 5N7

Representative's Name: **Laser Component S.A.S**
Representative's Address: **45 bis Route des Gardes**
92190 Meudon (France)

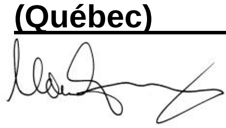
Type of Equipment: **Laser Power/Energy Meter**
Model No.: **UM & XLP**
Year of test & manufacture: **2011**

Standard(s) to which Conformity is declared: EN 61326-1: 2006 Emission generic standard

Standard	Description	Performance Criteria
CISPR 11 :2009 +A1 2010	Industrial, scientific and medical equipment – Radio- frequency disturbance characteristics – Limits and methods of measurement	Class A
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques- Electrostatic	Class B
EN 61000-4-3:2006 +A2:2010	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques- Radiated, Radio Frequency, electromagnetic field immunity	Class A
EN 61000-4-4 2004 +A1:2010	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4: Electrical fast transient/burst immunity.	Class B
EN 61000-4-6 2009	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 6: Immunity to conducted Radio Frequency.	Class A

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s)

Place: Québec (Québec) **Date : June 11, 2012**



(President)

9 UKCA DECLARATION OF CONFORMITY

Application of Council Directive(s): **2004/108/EC EMC Directive**

Manufacturer's Name: **Gentec Electro Optics, Inc.**
Manufacturer's Address: **445 St-Jean Baptiste, suite 160**
(Québec), Canada G2E 5N7

Representative's Name: **Laser Component S.A.S**
Representative's Address: **45 bis Route des Gardes**
92190 Meudon (France)

Type of Equipment: **Laser Power/Energy Meter**
Model No.: **UM & XLP**
Year of test & manufacture: **2011**

Standard(s) to which Conformity is declared: EN 61326-1: 2006 Emission generic standard

Standard	Description	Performance Criteria
CISPR 11 :2009 +A1 2010	Industrial, scientific and medical equipment – Radio- frequency disturbance characteristics – Limits and methods of measurement	Class A
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques- Electrostatic	Class B
EN 61000-4-3:2006 +A2:2010	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques- Radiated, Radio Frequency, electromagnetic field immunity	Class A
EN 61000-4-4 2004 +A1:2010	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4: Electrical fast transient/burst immunity.	Class B
EN 61000-4-6 2009	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 6: Immunity to conducted Radio Frequency.	Class A

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s)

Place: Québec (Québec) **Date : December 02, 2021**

(President)

WWW.GENTEC-EO.COM

LEADER IN LASER BEAM MEASUREMENT **SINCE 1972**

POWER & ENERGY METERS

BEAM PROFILING

THZ MEASUREMENT

CANADA

445 St-Jean-Baptiste, Suite 160
Quebec, QC, G2E 5N7
CANADA

T (418) 651-8003
F (418) 651-1174

info@gentec-eo.com

UNITED STATES

5825 Jean Road Center
Lake Oswego, OR, 97035
USA

T (503) 697-1870
F (503) 697-0633

info@gentec-eo.com

JAPAN

Office No. 101, EXL111 building,
Takinogawa, Kita-ku, Tokyo
114-0023, JAPAN

T +81-3-5972-1290
F +81-3-5972-1291

info@gentec-eo.com

CALIBRATION CENTERS

- 445 St-Jean-Baptiste, Suite 160
Quebec, QC, G2E 5N7, CANADA
- Werner von Siemens Str. 15
82140 Olching, GERMANY
- Office No. 101, EXL111 building,
Takinogawa, Kita-ku, Tokyo
114-0023, JAPAN